DOCUMENT RESUME

ED 336 275 SE 052 214

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TITLE African-American Science Student Learning Style, Halifax County, North Carolina.
PUB DATE Jul 91
NOTE 13p.; In: Proceedings of the International Conference of the Association for Psychological Type (9th, Richmond, VA, July 11-14, 1991).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; *Black Students; *Cognitive Style; *College Science; Cultural Awareness; *Cultural Differences; Dropouts; Higher Education; Minority Groups; Nonmajors; Science Education; Secondary Education; *Secondary School Science; *Student Characteristics
IDENTIFIERS African Americans; *Myers Briggs Type Indicator

ABSTRACT

A study documented differences in learning style between several populations and a high school population of African-American students enrolled in science classes in a Northeastern North Carolina county. The Black students were compared to high school samples (male and female), college science majors, and nonscience college majors. Students from five science classes (n=134) were administered the Myers Briggs Type Indicator (MBTI) during a 55-minute class period. Students were in either a College Prep Biology or Physical Science, Applied/Technical Biology or Physical Science or an Advanced Biology class. The comparisons were then made on the African-American sample population. There were more sensing and thinking types observed among the African-Americans. Also, these types were observed more frequently: sensing-thinking, sensing-perceiving, thinking-perceiving, and extraverted-sensing. A summary, introduction, content description, and conclusions are included. (KR)

AFRICAN-AMERICAN SCIENCE STUDENT LEARNING STYLE, HALIFAX COUNTY, NORTH CAROLINA

by

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IN Proceedings for the IX International Conference of the Association for Psychological Type, July 11-14, 1991, Richmond, Virginia.

AFRICAN-AMERICAN SCIENCE STUDENT LEARNING STYLE (HALIFAX COUNTY, NORTH CAROLINA)

Claudia T. Melear and Flora Pitchford

I. SUMMARY

Two ideas converged to direct this research: the need for more African-Americans in science careers and the high dropout rate of African-Americans, especially males. Epps & Jackson (1987) report that African-American students are more influenced toward school retention by in-school factors than are White Americans. For White Americans, social class and occupation of the parents have more influence than courses taken and grades. This evidence supports changing the in-school environment to promote retention of Black students. Evidence of student learning style that is free of bias can inform school personnel of appropriate ways to design learning episodes which may have widespread appeal for African-American students. The Myers-Briggs Type Indicator (MBTI) is a learning style instrument which provides bias free learning style profiles. The learning style paradigm of Curry (1983) and Claxton & Murrell (1987) state that the "core" of a person's learning style is best measured by the MBTI. One hundred and thirty-four (134) students were compared to Myers (1980) high school and science students and Melear's (1989) non-science major populations. ST and SP combinations were found to be more frequently occurring among the African-American students in all four comparisons.

II. INTRODUCTION

Atwater (1991) writes a multicultural analysis of both the Carnegie and Holmes reports. In this analysis, she notes that while the reports profess concerns for students of color, they do not ask what values and goals different cultures might bring to science education. The Carnegie report, according to Atwater, equates minority students with disadvantaged students. The assumption is that being non-White is in itself a disadvantage. She emphasizes the need to move away from the deficiency model of viewing minority students toward a valuing differences model.

Claxton & Murrell (1987) say that the greatest need in learning style research is to identify the learning styles of minorities. Hale-Benson (1986) says that African-American students have a different

learning style than White students, one that is unique to the African-American culture. Both Atwater and Hale-Benson say that culture determines learning style and that style of learning is important for teachers to know about. Both say that the emphasis of traditional education has been upon molding and shaping Black children so that they can be fitted into an educational process designed for White middle-class children. Atwater (1989 & 1991) describes the need for science teachers to be multicultural. She states that science teaching is geared toward the analytical field independent student.

Hale-Benson reports that Black children are more feeling-oriented and people oriented and more proficient at non-verbal communication than White children. She quotes Asa Hilliard who reports that the core of the African-American cultural style is a tendency to repond to things in terms of the whole picture instead of its parts. The Euro-American, on the other hand, tends to believe that anything can be divided. This is the positivistic or reductionistic view of the world, a view which drives the scientific enterprise.

Atwater (1991) says that science teachers' beliefs about different students might need to be changed. She says it is appropriate for science teachers to view the prevailing science culture (which is replicated in science classrooms) as deficient or disadvantaged, instead of viewing students who are different from the traditional reductionist and analytic as being deficient or disadvantaged. More specifically, the reductionistic view of the world which dominates science, may be a view through an incomplete lens.

Douglass (1977) writes that there are two types of thinkers: analytical and non-analytical. She states that an individual's learning style is influenced by factors such as background, parents and sex. Her study of high school biology student science learning showed that when instruction is matched to either an analytic or non-analytic approach, according to student learning style, more students learn more. So it is not without precedent that the Hale-Benson ideas are compelling, based on style alone, even without the African-American culture issue promoted by both Hale-Benson and Atwater.

III. CONTENT DESCRIPTION

This study was designed to provide data on learning styles of high school students enrolled in science classes in a Northeastern County in North Carolina. The county has one of the highest rates of both poverty and Black persons of any in North Carolina. Gaston (1970) however, showed that no intra-group differences were found on the MBTI among African-Americans in mid-western urban cities, southeastern small towns and rural areas. Students from five science classes were administered the MBTI during a 55 minute class period. Students were in either a College Prep Biology or Physical Science, Applied/Technical Biology or Physical Science or an Advanced Biology Class. Table 1 shows the distribution of types.

Insert Table 1 here

The most noticably large populations are listed. Seventy-five percent (75%) of the students are Sensing (S), while 40% are both Sensing (S) and Perceiving (P). Sensing (S) and Judging (J) students comprise 34% of the total. The most frequently occurring type is ESTJ of which most are females. Table 2 shows the African-American college prep males compared to Myers high school college prep males. (Tables 2-5 will be distributed at the conference and are available from the author). Among the test population of African-Americans, more students are Sensing (S), Extraverted-Perceptive (EP), Sensing -Thinking (ST), Sensing-Perceptive (SP), and Extraverted -Sensing (ES) than among Myers sample. Table 3 shows the African-American college prep females compared to Myers high school college prep females. Among the test population of African-Americans, more students are Sensing-Thinking (ST) and Sensing-Perceiving (SP) than among Myers sample.

Table 4 shows the total population of African-American students compared to Myers (college) science majors. Among the African-Americans, Extraverts (E), Sensing (S) and Feeling (F) students occur more frequently. Combinations of Extraverted-Perceiving (EP) and Extraverted-Judging (EJ) occur, as do Sensing-Thinking (ST) and Sensing-Feeling (SF). Sensing-Judging (SJ) and Sensing-Perceiving (SP), Feeling-Perceiving (FP), Introverted-Sensing (IS) and Extraverted-Sensing (ES) occur more frequently as well.

When the African-American high school students were compared with Melear's non-science college majors (Table 5), there were more Sensing (S) and Thinking (T) types observed among the African-Americans. Also, these types were observed more frequently: Sensing-Thinking (ST), Sensing-Perceiving (SP), Thinking-Perceiving (TP) and Extraverted-Sensing (ES).

IV. CONCLUSIONS

This study documents differences in learning style between several populations and a high school population of African-American students enrolled in a Northeastern North Carolina county. The Black students were compared to Myers' high school samples (male and female), Myers' college science majors, and Melear's non-science college majors.

Major differences are that many more African-American students are sensing than are White students, either in high school or college. When compared to Myers sample, male African-Americans are more E, S, T and P. Likewise, female African-American high school students are more S, T and P.

When African-American high school science students are compared to college science majors, the major difference from the high school comparisons is that, in addition to E, S, T, and P differences noted above, the Feeling (F) dimension occurs among the African-American students. This could, however, be a function of gender as the African-American population includes females and the science major population does not. In Melear's population of non-science majors, comparison again show more E, S, T and P individuals among African-American high school students.

For science educators, these data suggest examination of learning preferences which emerged in this study as prevalent among African-American students enrolled in high school science classes. The most likely MBTI combination for both male and female African-American students is E, S T and P. Briefly, implications for learning environments for students with those preferences are to

1) provide opportunities for talking
2) provide learning experiences which are mostly concrete and relate to real-life situations and are practical
3) provide logical learning experiences and
4) allow flexibility in both completion and location of tasks.

Recent emphasis on science learning support these recommendations. For example, the Scope, Sequence and Coordination Program of the National Science Teachers Association suggests cooperative learning (which gives students more opportunity to talk among themselves), data gathering and analysis of real world problems (concrete and logical experiences), and less emphasis on one right answer and one teaching format (less lecture and more variety in instruction).

These data support Hale-Benson, Atwater and Hilliard's claims in part, but only in part. The part most elusive to document is the claim of wholistic learning preferences. The MBTI does not really identify that as a learning preference, except perhaps in intuition (N), which these students are not, predominantly. It may be that a combination of learning style instruments would best detect if those claims are real.

Another, larger study is under way from several Eastern North Carolina school districts. This second study will attempt to support this initial study. Also, qualitative studies within one type and between races could elucidate if culture contributes to type differences, and if so, in what ways. Other studies need to be done to document intra-group differences since Gaston's study in 1970. For example, differences may exist between high school students from different parts of the country, and in different settings, that do not exist among college students. Other studies need to document African-American elementary and middle school student learning style. Concommitantly, teacher education, both pre and in-service, needs to include information on student learning style to promote multicultural education goals: valuing of differences among different cultural groups. Discrimination and prejudice will not stop in schools until differences are viewed as strengths and weaknesses, rather than as deficits. Thanks to Katherine Briggs and Isabel Myers, we have an instrument that measures and presents differences in just that way.

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TABLE 1

AFRICAN-AMERICAN
HIGH SCHOOL SCIENCE STUDENTS N=134
Halifax County, North Carolina)

ISTJ F=5 M=6 N=11 %=8.2	ISFJ F=3 M=3 N=6 %=4.4	INFJ F=1 M=2 N=3 %=2.2	INTJ F=0 M=1 N=1 %=.7
ISTP F=3 M=8 N=11 %=8.2	ISFP F=10 M=2 N=12 %=9.0	INFP F=1 M=1 N=2 %=1.5	INTP F=0 M=4 N=4 %=3.0
ESTP F=4 M=11 N=15 %=11.2	ESFP F=10 M=6 N=16 %=11.9	ENFP F=8 M=0 N=8 %=6.0	ENTP F=6 M=2 N=8 %=6.0
ESTJ F=15 M=7 N=22 %=16.4	ESFJ F=7 M=0 N=7 %=5.2	ENFJ F=2 M=1 N=3 %=2.2	ENTJ F=3 M=2 N=5 %=3.7

FEMALE = 78 %=58
MALE = 56 %=42

TOTAL 100

Source of data

Form G
Science Students, Southeast Halifax High School
Halifax, NC, Collected by Flora Pitchford, Grad.
East Carolina University

Group tabulated:

1990-91 College Prep Males, High School Physical Science and Biology

N = 30

MBTI Type Table
Center for Applications of Psychological Type

Legend: % = percent of total choosing this group who fall into this type. I = Self-selection index: Ratio of percent of type in group to % in sample.

SENSING types with THINKING	SENSING types with FEELING	INTUITIVE types with FEELING	INTUITIVE types with THINKING
ISTJ N= 4 %= 13.33 I= 1.65	ISFJ N= 2 %= 6.67 I= 1.68	INFJ N= 0 %= 0.00 I= 0.00	INTJ N= 0 %= 0.00 I= 0.00
ISTP N= 1 %= 3.33 I= 0.65	ISFP N= 2 %= 6.67 I= 1.53	INFP N= 1 %= 3.33 I= 0.80	INTP N= 0 %= 0.00 I= 0.00
ESTP # N= 7 %= 23.33 I= 3.02	ESFP " N= 5 %= 16.67 I= 2.59	ENFP N= 0 %= 0.00 I= 0.00	ENTP N= 2 %= 6.67 I= 0.85
ESTJ N= 5 %= 16.67 I= 1.06	ESFJ N= 0 %= 0.00 I= 0.00	ENFJ N= 1 %= 3.33 I= 0.94	ENTJ N= 0 %= 0.00 I= 0.00

		N	%	I	
J	E	20	66.67	1.08	
U	I	10	33.33	0.87	
D I	S	26	86.67	1.50	#
G N	N	4	13.33	0.32	#
I T	T	19	63.33	1.02	
N R	F	11	36.67	0.96	
G O	J	12	40.00	0.78	
V	P	18	60.00	1.23	
P E	IJ	6	20.00	1.06	
E R	IP	4	13.33	0.68	
R T	EP	14	46.67	1.60	"
C S	EJ	6	20.00	0.62	
E	ST	17	56.67	1.55	"
P	SF	9	30.00	1.41	
T	NF	2	6.67	0.39	
I E	NT	2	6.67	0.26	"
V X	SJ	11	36.67	1.07	
E T	SP	15	50.00	2.11	*
S R	NP	3	10.00	0.40	
A	NJ	1	3.33	0.20	"
J V	TJ	9	30.00	0.86	
U E	TP	10	33.33	1.25	
D R	FP	8	26.67	1.21	
G T	FJ	3	10.00	0.62	
I S	IN	1	3.33	0.20	"
N	EN	3	10.00	0.40	
G	IS	9	30.00	1.39	
	ES	17	56.67	1.56	"

TABLE 2

Note concerning symbols following the selection ratios:
" implies significance at the .05 level, i.e., Chi-square >3.8;
implies significance at the .01 level, i.e., Chi-square > 6.6;
* implies significance at the .001 level, i.e., Chi-square > 10.8.
_ (underscore) indicates Fisher's exact probability used instead Chi-square.

Base population used in calculating selection ratios:
High School Students, College Prep, Fig. 3,p.31.Myers, Gifts Differing(Males)
Base total N = 3503. Sample and base are independent.

* * * * Calculated values of Chi-square or Fisher's exact probability * * * *
Type table order

				E	0.3331	IJ	0.0261	SJ	0.0804	IN	0.0482
0.3010	0.6312	0.6579	0.3993	I	0.3331	IP	0.4928	SP	11.3455	EN	0.0578
				S	0.0012	EP	4.3913	NP	0.0579	IS	1.2523
0.7369	0.6406	1.000	0.2571	N	0.0012	EJ	2.0747	NJ	0.0481	ES	5.3182
				T	0.0295	ST	5.1370	TJ	0.3378		
9.9815	0.0419	0.1662	1.000	F	0.0295	SF	1.3614	TP	0.6635		
				J	1.4891	NF	0.1502	FP	0.3607		
1.000	0.2581	1.000	0.2598	P	1.4891	NT	0.0183	FJ	0.4619		

Form G.
Science Students,Southeast Halifax High School Halifax, NC, Collected by Flora Pitchford, Grad. East Carolina Univ

1990-91 College Prep Females,High School Physical Science and Biology

N = 55

Legend: % = percent of total choosing this group who fall into this type. I = Self-selection index: Ratio of percent of type in group to % in sample.

SENSING types with THINKINC	SENSING types with FEELING	INTUITIVE types with FEELING	INTUITIVE types with THINKING
ISTJ	ISFJ	INFJ	INTJ
N= 3	N= 2	N= 1	N= 0
%= 5.45	%= 3.64	%= 1.82	%= 0.00
I= 1.63	I= 0.53	I= 0.66	I= 0.00
ISTP	ISFP #	INFP	INTP
N= 2	N= 7	N= 1	N= 0
%= 3.64	%= 12.73	%= 1.82	%= 0.00
I= 1.67	I= 2.61	I= 0.29	I= 0.00
ESTP	ESFP	ENFP	ENTP
N= 4	N= 7	N= 7	N= 6
%= 7.27	%= 12.73	%= 12.73	%= 10.91
I= 2.09	I= 1.13	I= 1.02	I= 2.12
ESTJ	ESFJ	ENFJ	ENTJ
N= 8	N= 5	N= 2	N= 0
%= 14.55	%= 9.09	%= 3.64	%= 0.00
I= 1.49	I= 0.52	I= 0.64	I= 0.00

			N	%	I
J		E	39	70.91	1.03
U		I	16	29.09	0.93
D	I	S	38	69.09	1.16
G	N	N	17	30.91	0.76
I	T	T	23	41.82	1.30
N	R	F	32	58.18	0.86
G	O	J	21	38.18	0.75
	V	P	34	61.82	1.27
P	E	IJ	6	10.91	0.74
E	R	IP	10	18.18	1.11
R	T	EP	24	43.64	1.35
C	S	EJ	15	27.27	0.75
E		ST	17	30.91	1.65 "
P		SF	21	38.18	0.94
T		NF	11	20.00	0.73
I	E	NT	6	10.91	0.82
V	X	SJ	18	32.73	0.87
E	T	SP	20	36.36	1.67 "
S	R	NP	14	25.45	0.94
	A	NJ	3	5.45	0.40
J	V	TJ	11	20.00	1.10
U	E	TP	12	21.82	1.57
D	R	FP	22	40.00	1.14
G	T	FJ	10	18.18	0.55 "
I	S	IN	2	3.64	0.26 "
N		EN	15	27.27	1.02
G		IS	14	25.45	1.47
		ES	24	43.64	1.04

TABLE 3

Note concerning symbols following the selection ratios:
" implies significance at the .05 level, i.e., Chi-square >3.8;
implies significance at the .01 level, i.e., Chi-square > 6.6;
* implies significance at the .001 level, i.e., Chi-square > 10.8.
_ (underscore) indicates Fisher's exact probability used instead Chi-square.

Base population used in calculating selection ratios:
High School Students, College Prep,Fig 7 p35 Myers, Gifts Differing(females)
Base total N = 2155. Sample and base are independent.

* * * * Calculated values of Chi-square or Fisher's exact probability * * * *
Type table order

				E	0.1143	IJ	0.6482	SJ	0.5507	IN 0.0267
0.4322	0.4312	1.000	0.6241	I	0.1143	IP	0.1201	SP	6.5832	EN 0.0111
				S	2.0746	EP	3.0839	NP	0.0656	IS 2.4637
0.6331	0.8779	0.2554	0.2641	N	2.0746	EJ	1.9273	NJ	0.1052	ES 0.0496
				T	2.3327	ST	5.1442	TJ	0.1178	
0.1310	0.1126	0.0029	3.5468	F	2.3327	SF	0.1405	TP	2.7986	
				J	3.6274	NF	1.4239	FP	0.6026	
1.3901	0.1071	0.5858	0.2600	P	3.6274	NT	0.2706	FJ	5.3525	

Source of data

Form G
Science Students, Southeast Halifax High School Halifax, NC, Collected by Flora Pitchford, Grad. East Carolina Univ.

Group tabulated:

College Prep & Applied/Technical Physical Science & Biology Students

N = 134

MBTI Type Table
Center for Applications of Psychological Type

Legend: % = percent of total choosing this group who fall into this type. I = Self-selection index: Ratio of percent of type in group to % in sample.

SENSING types with THINKING	SENSING types with FEELING	INTUITIVE types with FEELING	INTUITIVE types with THINKING
ISTJ	ISFJ "	INFJ	INTJ _
N= 11	N= 6	N= 3	N= 1
%= 8.21	%= 4.48	%= 2.24	%= 0.75
I= 1.48	I= 2.63	I= 0.36	I= 0.04
ISTP #	ISFP *	INFP #	INTP _
N= 11	N= 12	N= 2	N= 4
%= 8.21	%= 8.96	%= 1.49	%= 2.99
I= 3.22	I= 4.21	I= 0.18	I= 0.17
ESTP *	ESFP _	ENFP	ENTP
N= 15	N= 16	N= 8	N= 8
%= 11.19	%= 11.94	%= 5.97	%= 5.97
I= 6.58	I= 84.18	I= 0.77	I= 0.53
ESTJ *	ESFJ #	ENFJ	ENTJ "
N= 22	N= 7	N= 3	N= 5
%= 16.42	%= 5.22	%= 2.24	%= 3.73
I= 8.90	I= 4.60	I= 0.58	I= 0.36

			N	%	I	
J		E	84	62.69	1.65	*
U		I	50	37.31	0.60	*
D	I	S	100	74.63	4.46	*
G	N	N	34	25.37	0.39	*
I	T	T	77	57.46	0.84	"
N	R	F	57	42.54	1.36	"
G	O	J	58	43.28	0.89	
	V	P	76	56.72	1.11	
P	E	IJ	21	15.67	0.50	*
E	R	IP	29	21.64	0.71	"
R	T	FP	47	35.07	1.68	*
C	S	EJ	37	27.61	1.61	#
E		ST	59	44.03	2.79	*
P		SF	41	30.60	5.99	*
T		NF	16	11.94	0.46	*
I	E	NT	18	13.43	0.23	*
V	X	SJ	46	34.33	3.36	*
E	T	SP	54	40.30	6.18	*
S	R	NP	22	16.42	0.37	*
	A	NJ	12	8.96	0.23	*
J	V	TJ	39	29.10	0.81	
U	E	TP	38	28.36	0.86	
D	R	FP	38	28.36	1.55	#
G	T	FJ	19	14.18	1.10	
I	S	IN	10	7.46	0.15	*
N		EN	24	17.91	0.54	*
G		IS	40	29.85	2.51	*
		ES	60	44.78	9.28	*

Note concerning symbols following the selection ratios:
" implies significance at the .05 level, i.e., Chi-square >3.8;
implies significance at the .01 level, i.e., Chi-square > 6.6;
* implies significance at the .001 level, i.e., Chi-square > 10.8.
_ (underscore) indicates Fisher's exact probability used instead Chi-square.

TABLE 4

Base population used in calculating selection ratios:
College Science Students, fig 15 (N=705) Myers, Gifts Differing, p. 43 (Males)
Base total N = 705. Sample and base are independent.

* * * * Calculated values of Chi-square or Fisher's exact probability * * * *
Type table order

				E	28.1453	IJ 13.9056	SJ 54.1794	IN 83.2778
1.4399	4.1316	0.0664	0.0000	I	28.1453	IP 4.1545	SP122.3400	EN 12.3471
				S	196.2023	EP 12.8148	NP 37.4246	IS 28.7589
10.7933	16.8526	0.0051	0.0000	N	196.2023	EJ 8.0424	NJ 44.1368	ES180.6674
				T	6.5377	ST 84.5347	TJ 2.2825	
32.5719	0.0000	0.5437	3.3208	F	6.5377	SF 87.7751	TP 1.0679	
				J	1.3702	NF 12.4334	FP 7.1482	
59.8254	10.7226	0.4558	0.0219	P	1.3702	NT 86.1315	FJ 0.1597	

Source of data

Form G
Science Students,Southeast
Halifax High School
Halifax, NC, Collected by
Flora Pitchford, Grad.
East Carolina Univ.

Group tabulated:

Regular Science Students (Males and Females) Southeast Halifax High,1990-91

N = 134

MBTI Type Table
Center for Applications of Psychological Type

Legend: % = percent of total choosing this group who fall into this type. I = Self-selection index: Ratio of percent of type in group to % in sample.

SENSING types with THINKING	SENSING types with FEELING	INTUITIVE types with FEELING	INTUITIVE types with THINKING
ISTJ	ISFJ	INFJ	INTJ
N= 11	N= 6	N= 3	N= 1
%= 8.21	%= 4.48	%= 2.24	%= 0.75
I= 1.13	I= 0.47	I= 0.94	I= 0.46
ISTP "	ISFP	INFP	INTP
N= 11	N= 12	N= 2	N= 4
%= 8.21	%= 8.96	%= 1.49	%= 2.99
I= 2.12	I= 1.43	I= 0.36	I= 0.84
ESTP "	ESFP	ENFP "	ENTP
N= 15	N= 16	N= 8	N= 8
%= 11.19	%= 11.94	%= 5.97	%= 5.97
I= 1.79	I= 1.49	I= 0.48	I= 1.09
ESTJ #	ESFJ "	ENFJ	ENTJ
N= 22	N= 7	N= 3	N= 5
%= 16.42	%= 5.22	%= 2.24	%= 3.73
I= 1.91	I= 0.48	I= 0.40	I= 0.90

			N	%	I	
J	E		84	62.69	1.02	
U	I		50	37.31	0.97	
D I	S		100	74.63	1.23	#
G N	N		34	25.37	0.64	#
I T	T		77	57.46	1.41	*
N R	F		57	42.54	0.72	*
G O	J		58	43.28	0.86	
V	P		76	56.72	1.14	
P E	IJ		21	15.67	0.75	
E R	IP		29	21.64	1.21	
R T	EP		47	35.07	1.09	
C S	EJ		37	27.61	0.94	
E	ST		59	44.03	1.69	*
P	SF		41	30.60	0.88	
T	NF		16	11.94	0.49	#
I E	NT		18	13.43	0.90	
V X	SJ		46	34.33	0.95	
E T	SP		54	40.30	1.65	*
S R	NP		22	16.42	0.64	"
A	NJ		12	8.96	0.65	
J V	TJ		39	29.10	1.34	
U E	TP		38	28.36	1.48	"
D R	FP		38	28.36	0.92	
G T	FJ		19	14.18	0.50	*
I S	IN		10	7.46	0.64	
N	EN		24	17.91	0.65	"
G	IS		40	29.85	1.11	
	ES		60	44.78	1.33	"

TABLE 5

Note concerning symbols following the selection ratios:
" implies significance at the .05 level, i.e., Chi-square >3.8;
implies significance at the .01 level, i.e., Chi-square > 6.6;
* implies significance at the .001 level, i.e., Chi-square > 10.8.
_ (underscore) indicates Fisher's exact probability used instead Chi-square.

Base population used in calculating selection ratios:
Non-major Undergraduates In Biology-----Dr. C. Melear Dissertation
Base total N = 673. Sample and base are independent.

* * * * Calculated values of Chi-square or Fisher's exact probability * * * *
Type table order

				E	0.0822	IJ	1.8420	SJ	0.1803	IN	2.0822
0.1399	3.5720	1.0000	0.7017	I	0.0822	IP	1.0782	SP	14.3831	EN	5.4923
				S	9.3948	EP	0.4516	NP	5.1116	IS	0.4911
4.8240	1.3188	0.2076	0.8060	N	9.3948	EJ	0.1496	NJ	2.3354	ES	5.9506
				T	12.5228	ST	17.6386	TJ	3.4732		
4.1769	2.1639	4.5219	0.0474	F	12.5228	SF	0.8070	TP	5.7512		
				J	2.0622	NF	10.1597	FP	0.3043		
7.6126	3.9565	0.1301	1.0000	P	2.0622	NT	0.1820	FJ	11.7072		